

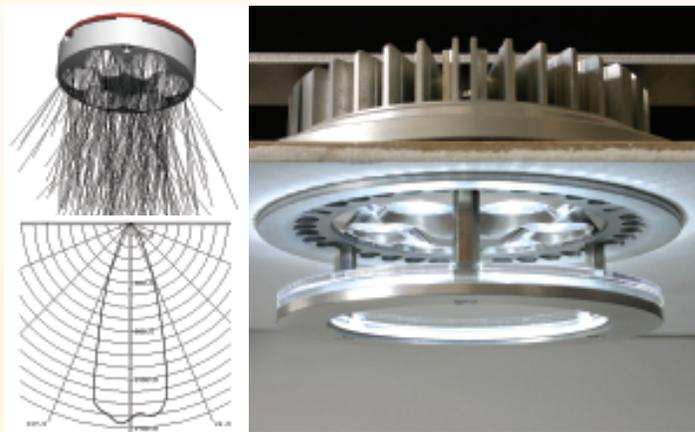
# LED Luminaires for Elevators

**L**EDs are an ideal solution for applications that require low-profile luminaires. The LED's smaller size, long life, low energy consumption, and durability make it a great choice when space is at a premium.

During a two-year project, the LRC developed and evaluated a low-profile LED downlight to replace a less efficient incandescent luminaire in an elevator application. The goal was to reduce energy consumption by 25 percent while preserving light levels inside the elevator.

## Luminaire development

The prototype downlights consisted of six high-flux white LEDs in a custom reflector and heat sink package of less than two inches high. The design efficiently balanced the required light output and distribution, visual comfort, and thermal management within a small and attractive package. The LRC used optical modeling software to optimize the efficiency of the reflector. LRC researchers also designed the heat sink for thermal management and the aluminum-core printed circuit board to house the LEDs and provide electrical connections.



Left: Optical ray-tracings show the paths of light exiting the reflector array (top) and the intensity distribution of the array (bottom). Right: Close-up of the prototype.

## Sponsors

*Project:* California Energy Commission PIER Program, Architectural Energy Corporation, Westinghouse Lighting  
*Equipment:* Advance Transformer Co., Lumileds Lighting  
*Site:* Otis Elevator Co., Rensselaer Polytechnic Institute



## Field study

Six downlights, installed in a public elevator on the RPI campus, required 165 watts of electricity (including a complementary LED cove system) compared to 300 watts for the 50-watt R20 systems they replaced. At the system efficacy of the LEDs used, an energy savings of 45 percent was realized over the actual incandescent system (~5.5 lm/W).

The LED luminaires provided similar light distribution and illuminance levels inside the elevator cabin with better comfort and attractiveness, according to passengers. The survey also showed that better color rendering and a color temperature lower than 6500 K would be desirable.

## Prototype performance

- LED module efficacy: 18 lm/W at 15.4 W
- Reflector efficiency: 75 percent
- Luminaire light output: 210 lumens
- Luminaire power (including driver): 21 W
- Luminaire efficacy: 10 lm/W (210 lm at 21 W)
- Color rendering index of 65 at 6500 K
- 40-degree beam angle